

MODEL COURSE 1.38

MARINE ENVIRONMENTAL AWARENESS

2011 Edition

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The course was prepared by ProSea Foundation, marine education. It is a result of ten years experience in marine environmental awareness training. The development was supported and facilitated by the Ministry of Transport, Public Works and Water management, The Netherlands.

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Foreword

Since its inception the International Maritime Organization (IMO) has recognized the importance of human resources to the development of the maritime industry and has given the highest priority to assisting developing countries in enhancing their maritime training capabilities through the provision or improvement of maritime training facilities at national and regional levels. IMO has also responded to the needs of developing countries for postgraduate training for senior personnel in administrations, ports, shipping companies and maritime training institutes by establishing the world Maritime University in Malmö, Sweden, in 1983.

Following the adoption of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW), a number of IMO Member Governments had suggested that IMO should develop model training courses to assist in the implementation of the Convention and in achieving a more rapid transfer of information and skills regarding new developments in maritime technology. IMO training advisers and consultants also subsequently determined from their visits to training establishments in developing countries that the provision of model courses could help instructors improve the quality of their existing courses and enhance their implementation of the associated Conference and IMO Assembly resolutions.

In addition, it was appreciated that a comprehensive set of short model courses in various fields of maritime training would supplement the instruction provided by maritime academies and allow administrators and technical specialists already employed in maritime administrations, ports and shipping companies to improve their knowledge and skills in certain specialized fields. With the generous assistance of the Government of Norway, IMO developed model courses in response to these generally identified needs and now keeps them updated through a regular revision process taking into account any amendments to the requirements prescribed in IMO instruments and any technological developments in the field.

These model courses may be used by any training institution and, when the requisite financing is available, the Organization is prepared to assist developing countries in implementing any course.

E. E. MITROPOULOS
Secretary-General



Introduction

Marine environmental awareness represents the contribution of the human element to the prevention of pollution. Therefore, marine environmental awareness training brings together two important aspects of modern shipping: care for the marine environment and the importance of human performance.

The IMO Strategic Plan for the Organization for the six-year period 2010 to 2015 (A.1011(26)) seeks to enhance the environmental conscience of the shipping industry: “The mission of the International Maritime Organization (IMO) as a United Nations specialized agency is to promote safe, secure, environmentally sound, efficient and sustainable shipping through cooperation. The enhancement of a sustainable environmental policy for the shipping industry remains a high profile matter. The heightened concern at the impact of global shipping activities on the environment has given further impetus to efforts by the Organization to develop sustainable and environmentally conscious means of preventing pollution from ships, such as those aimed at reducing atmospheric pollution and addressing climate change and global warming; ensuring the preservation of aquatic systems; and preventing the introduction of harmful and polluting substances from ships into the marine environment.”

The Strategic Plan also addresses human performance: “As IMO strives for full compliance with its instruments, their effectiveness will come under scrutiny with each incident resulting from human error. The challenge for IMO is to place increased emphasis on the contribution of the human element to safer, more secure and environmentally friendly shipping and continuously to improve measures aimed at enhancing human performance in the maritime industry.”

IMO identified strategic directions (SD) for the Organization and states in strategic direction 7.4: “IMO will focus on reducing and eliminating any adverse impact by shipping on the environment by increasing the emphasis on the role of the human element in environmentally sound shipping.”

This is exactly what this model course “Marine environmental awareness” aims to do. Marine environmental awareness training offers knowledge of the importance and diversity of the marine environment, as well as understanding and awareness of the impacts of shipping activities on the (marine) environment. It offers insight into the background of IMO regulations and enhances compliance. The training also stimulates personal responsibility to use solutions that contribute to environmentally sound shipping.

Part A: Course Framework

■ Scope

The purpose of this IMO model course is to assist maritime training institutes and their teaching staff to organize and introduce marine environmental awareness training.

This model course “Marine environmental awareness” specifically focuses on the contribution of the human element to the prevention of pollution and is intended to educate, stimulate and empower officers on board vessels to contribute to environmentally sound shipping and to ensure compliance with pollution prevention measures. This model course is closely connected to both the ISM Code¹ and the STCW Code².

- The purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and for pollution prevention. In matters of safety and pollution prevention it is the commitment, competence, attitude and motivation of individuals at all levels that determines the end result.
- Sections A-II/1 of Chapter II, A-III/1 and A-III/6 of Chapter III of the STCW Code include the competence “ensure compliance with prevention pollution requirements” as part of function: “Controlling the operation of a ship and care for persons on board at the operational level”. In addition, the competence “take precautions to prevent pollution of the marine environment” is part of the basic training in Chapter VI.

The model course “Marine environmental awareness” is designed as an addition to courses about IMO regulations, technical installations and procedures to safeguard the environment. Marine environmental awareness training focuses specifically on the human element. Better understanding of the effects of shipping on the environment will lead to better compliance with regulations and better use of technical installations and procedures. The model course aims to inspire people to play a positive and proactive role, to take responsibility, and to contribute to environmentally sound shipping.

■ General objectives

Those who have successfully completed the course will be able to demonstrate knowledge and understanding of the importance of preventing pollution to the (marine) environment. This knowledge and understanding shall include, but is not limited to the following topics:

- concept of sustainable shipping
- complexity and diversity of the marine environment
- impact of shipping on the environment
- role of regulations, procedures and technical installations to protect the environment
- marine environmental awareness, personal responsibility
- role of human element to prevent pollution, proactive measures.

¹ ISM Code = International Safety Management Code.

² STCW Code = Seafarer’s Training, Certification and Watchkeeping Code.

Those who have successfully completed the course shall demonstrate the intention to:

- fully observe procedures for monitoring ship-board operations and ensure compliance with requirements for environmental protection
- act to ensure that the positive environmental reputation of shipping is maintained.

■ Entry standards

The course is designed for officers and officers in charge of a navigational or an engineering watch.

■ Course certificate

On successful completion of the course appropriate documentary evidence is required to be issued to the trainee.

■ Course intake limitations

The maximum number of trainees in the course should depend on course set-up and the facilities and equipment available, bearing in mind the aims and objectives of this model course.

■ Staff requirements

The instructor in charge shall have had training and/or equivalent knowledge in the subject matter of this course, including but not limited to sustainable shipping, the marine environment, impact of shipping on the environment, and role of regulations, procedures, technical installations and the human element in protecting the environment.

■ Teaching facilities and equipment

For the theoretical part of the course, a classroom equipped with presentation facilities and audiovisual materials (including a DVD player) is recommended. For the workshops, sufficient space should be available to facilitate group work, preferably in separate rooms. Sufficient materials should be available to enable groups to present their results (flipchart, overhead, PowerPoint or other means of visual presentation).

■ Teaching aids (A)

- A1 Instructor manual (part D of the course)
- A2 Article about the marine environment (Appendix to instructor manual D of the course)
- A3 BBC Earth – Oceans
Available through internet or DVD stores, order number: EAN 8717344742221
- A4 DVD about a local marine area (to be selected locally)

A5 Invaders from the Sea, a BBC Worldwide – IMO production

Available from:

IMO Publishing

4 Albert Embankment

London SE1 7SR

United Kingdom

e-mail: sales@imo.org

Tel: +44 (0)20 7735 7611

Fax: 44 (0)20 7587 3241

A6 Video “Adverse effects of oil on plankton”

Video “Pools of Garbage”

Video “Albatross ingestion of plastics”

Video “The growing problem of micro plastics”

Available from:

ProSea Foundation

Drieharingstraat 25

3511 BH Utrecht

The Netherlands

E-mail: info@prosea.info

Tel: +31 (0)30 2300 077

Audiovisual examples listed above may be replaced by other similar audiovisual material at the discretion of the training provider and administration.

■ Bibliography and Websites (B)

B1 Algalita Marine Research Foundation (AMRF) – www.algalita.org

B2 Clean Shipping Project – www.cleanshippingproject.se

B3 Global Ballast Water Management programme (GloBallast)
www.globallast.imo.org

B4 Green Award Foundation – www.greenaward.org

B5 Intergovernmental Panel on Climate Change (IPCC) – www.ipcc.ch

B6 International Maritime Organization – www.imo.org

B7 International Tanker Owners Pollution Federation (ITOPF) – www.itopf.com

B8 MAN B&W – www.mandieselturbo.com

B9 NOAA Marine Debris Programme – www.marinedebris.noaa.gov

B10 ProSea Foundation, marine education – www.prosea.info

B11 United Nations Environment Programme (UNEP)
www.unep.org/regionalseas/marinelitter

B12 Wärtsilä – www.wartsila.com

■ IMO References (R)

- R1 International Safety Management (ISM) Code and Guidelines, 2010 edition
- R2 MARPOL 73/78, consolidated 2006 edition
- R3 Particularly Sensitive Sea Areas (PSSA), 2007 edition
- R4 Pollution Prevention Equipment under MARPOL, 2006 edition
- R5 Standards of Training, Certification and Watchkeeping for Seafarers Code, STCW Convention, 2010
- R6 Strategic plan for the Organization (for the six-year period 2010 to 2015) (A.1011-26)
- R7 BWM Convention & Guidelines, 2009 edition
- R8 Anti-Fouling Convention, 2005 edition
- R9 Guidelines for the development of the inventory of hazardous materials, Resolution MEPC.179(59)
- R10 Second IMO GHG study, 2009

■ Textbooks (T)

- T1 ProSea Foundation, 2011. Introduction. Marine Environmental Awareness Course Information Package, 14 pages.
- T2 ProSea Foundation, 2011. Personal opinions Workshop. Marine Environmental Awareness Course Information Package, 4 pages.
- T3 ProSea Foundation, 2011. Marine Environment. Marine Environmental Awareness Course Information Package, 14 pages.
- T4 ProSea Foundation, 2011. Regional marine areas. Marine Environmental Awareness Course Information Package, 14 pages.
- T5 ProSea Foundation, 2011. Discharges to the Sea: oil. Marine Environmental Awareness Course Information Package, 16 pages.
- T6 ProSea Foundation, 2011. Discharges to the Sea: chemicals. Marine Environmental Awareness Course Information Package, 12 pages.
- T7 ProSea Foundation, 2011. Discharges to the Sea: sewage. Marine Environmental Awareness Course Information Package, 8 pages.
- T8 ProSea Foundation, 2011. Discharges to the Sea: solid waste. Marine Environmental Awareness Course Information Package, 22 pages.
- T9 ProSea Foundation, 2011. Reputation of Shipping Workshop. Marine Environmental Awareness Course Information Package, 10 pages.
- T10 ProSea Foundation, 2011. Emissions to Air: Greenhouse gases. Marine Environmental Awareness Course Information Package, 18 pages.
- T11 ProSea Foundation, 2011. Other emissions to Air: SO_x, NO_x, PM. Marine Environmental Awareness Course Information Package, 16 pages.
- T12 ProSea Foundation, 2011. Introduction of invasive species. Marine Environmental Awareness Course Information Package, 14 pages.
- T13 ProSea Foundation, 2011. Underwater Noise. Marine Environmental Awareness Course Information Package, 10 pages.
- T14 ProSea Foundation, 2011. Anti-fouling paint. Marine Environmental Awareness Course Information Package, 8 pages.
- T15 ProSea Foundation, 2011. Ship recycling. Marine Environmental Awareness Course Information Package, 8 pages.
- T16 ProSea Foundation, 2011. Pollution prevention measures Workshop. Marine Environmental Awareness Course Information Package, 4 pages.

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Part B: Course Outline and Timetable

Part B (1): Course Outline

Subject Area	Approximate Time (Hours)	
	Film/Lecture	Workshop
1. Introduction 1.1 Global context 1.2 Sustainable shipping 1.3 Marine environmental awareness 1.4. Course overview	0.5	
2. Personal opinions		1
3. Marine environment 3.1 Importance of the oceans 3.2 Marine ecology 3.3 Difference between coastal seas and open ocean 3.4 Particularly Sensitive Sea Areas (PSSAs)	1	
4. Regional marine area 4.1 Describe a regional or local marine area of choice	0.5	
5. Discharges to the sea 5.1 Environmental impact of oil, chemicals, sewage and solid waste 5.2 Pollution prevention measures	2	
6. Reputation of shipping		1
7. Emissions to air, greenhouse gases 7.1 Environmental impact of emissions of greenhouse gases 7.2 Pollution prevention measures	0.75	
8. Other emissions to the air 8.1 Environmental impact of engine emissions (SO _x , NO _x , PM) 8.2 Other air pollutants from ships 8.3 Pollution prevention measures	0.75	
9. Introduction of invasive species including ballast water 9.1 Environmental impact of transfer of species 9.2 Pollution prevention measures	1	
10. Other impacts to the marine environment 10.1 Environmental impact of underwater noise 10.2 Environmental impact of antifouling paint 10.3 Environmental impact of recycling of ships	1	
11. Pollution prevention measures		1.5
12. Personal involvement 12.1 Personal behaviour 12.2 Personal responsibility 12.3 Officer responsibility		1
SUB-TOTAL	7.5	4.5
TOTAL	12 HOURS	

Part B (2): Course Timetable

A timetable is presented. Please bear in mind that any timetable is subject to variation, depending on the general need of the trainees and local circumstances.

Day 1	1st Period (3.0 hours)	2nd Period (3.0 hours)
	1. Introduction – lecture 1.1 Global context 1.2 Sustainable shipping 1.3 Marine environmental awareness 1.4 Course overview 2. Personal opinions – workshop 3. Marine environment – lecture 3.1 Importance of the oceans 3.2 Marine ecology 3.3 Difference between coastal seas and open ocean 3.4 Particularly Sensitive Sea Areas (PSSAs) 4. Regional marine area – film/lecture 4.1 Describe a regional or local marine area of choice	5. Discharges to the sea – lecture 5.1 Environmental impact of oil, chemicals, sewage and solid waste 5.2 Pollution prevention measures 6. Reputation of shipping – workshop
Day 2	1st Period (3.0 hours)	2nd Period (3.0 hours)
	7. Emissions to air, greenhouse gases – lecture 7.1 Environmental impact of emissions of greenhouse gases 7.2 Pollution prevention measures 8. Other emissions to the air – lecture 8.1 Environmental impact of engine emissions (SO _x , NO _x , PM) 8.2 Other air pollutants from ships 8.3 Pollution prevention measures 9. Introduction of invasive species including ballast water – film/lecture 9.1 Environmental impact of transfer of species 9.2 Pollution prevention measures 10. Other impacts to the marine environment – lecture 10.1 Environmental impact of underwater noise 10.2 Environmental impact of antifouling paint 10.3 Environmental impact of recycling of ships	11. Pollution prevention measures – workshop 12. Personal involvement and personal responsibilities – workshop 12.1 Personal behaviour 12.2 Personal responsibility 12.3 Officer responsibility

Note: Teaching staff should note timetables are suggestions only as regards sequence and length of time allocated to each objective. These factors may be adapted by instructors to suit individual groups of trainees depending on their experience and ability and on the equipment and staff available for training.

The detailed teaching syllabus has been written in learning objective format in which the objective describes what the trainee should be able to do to demonstrate that knowledge and understanding has been transferred and marine environmental awareness has been achieved. This format is an appropriate teaching and assessment tool to express:

- All detailed learning objectives are understood to be prefixed by the words: “After completing this course the trainee will be able to ...”

Knowledge, Understanding and Proficiency		IMO Reference	Textbooks, Bibliography	Teaching Aid
1	Introduction – lecture (0.5 hour)			
1.1	Global context	R6	T1 B6	A1-Sec 1
	.1 Recognize the importance of shipping for the world economy			
	.2 Recognize the environment impact of shipping			
1.2	Sustainable shipping	R6	B2 B4 B6	
	.1 Describe sustainable shipping			
	– Define sustainable development as a balance of three Ps – People, Planet, Profit			
	– Explain the meaning of the three Ps			
	– Recognize the need for sustainable shipping			
1.3	Marine environmental awareness	R1	B10	A1-Sec 2
	.1 Recognize the role of the human element (people in shipping) in pollution prevention	R5		
1.4	Course review			
2	Personal opinions – workshop (1 hour)		T2	
	.1 Express a personal opinion about current environmental challenges (problems) for the shipping industry			
	.2 Relate his/her opinion to the opinions of others trainees			

Knowledge, Understanding and Proficiency	IMO Reference	Textbooks, Bibliography	Teaching Aid
3 Marine environment – lecture (1 hour) 3.1 Importance of the oceans .1 Describe why the oceans are of vital importance for humankind – Recognize that 60% of the world population lives near the sea – Explain the importance of the oceans as a source of food – Explain the importance of the oceans for the global climate 3.2 Marine ecology .1 Describe the basic principles of marine ecology – Recognize the importance of phytoplankton (primary production) as the basis of sea life – Give an example of a food chain – Describe the principle of energy flow in the food chain – Describe the principle of energy loss in the food chain (10% rule) – Describe the importance of bacteria and viruses (nutrient cycle) – Recognize that food chains are connected in complex food webs 3.3 Difference between coastal seas and open oceans .1 Compare coastal seas and open oceans – Describe the difference in living circumstances between open oceans and coastal seas, including but not limited to availability of nutrients – Describe the difference in food chain length between open oceans and coastal seas – Recognize the diversity and abundance of life in coastal seas 3.4 Particularly Sensitive Sea Areas (PSSAs) .1 Recognize that IMO has established Particularly Sensitive Sea Areas (PSSAs) to protect marine areas from shipping activities – List existing PSSAs – List potential protective measures in PSSAs	R3	T3	A1-Sec 3 A2

Knowledge, Understanding and Proficiency	IMO Reference	Textbooks, Bibliography	Teaching Aid
4 Regional marine area – film/lecture (0.5 hour) 4.1 Describe a regional or local marine area of choice – Describe the area – List forms of marine life that live there – Give an example of a food chain in this area – Give an example of the importance of the area for humans 5 Discharges to the sea – lecture (2 hours) 5.1 Environmental impact of oil, chemicals, sewage and solid waste .1 Describe the impact of oil in the marine environment – Recognize the varied and complex composition of oil and oil products – List processes that determine the fate of oil in the marine environment – Describe ecological impacts of oil in the marine environment – Describe economic impacts of oil in the marine environment – Recognize the contribution of shipping to the discharge of oil to the sea – Describe the relative contribution of accidents and operational discharge of oil from ships .2 Describe the impact of chemicals in the marine environment – Describe ways chemicals enter the marine environment from a ship – List reasons why a chemical might be hazardous – Define the terms acute toxicity and chronic toxicity – Define the term bioaccumulation – Define the term biodegradation – Describe ecological impacts of chemicals in the marine environment .3 Describe the impact of sewage in the marine environment – Define the term sewage – Describe the ecological impact of sewage in the marine environment		T4 T5 B7 B7 T6 T7	A1-Sec 3 A3 A4 A1-Sec 4.1, Sec 4.2, Sec 4.3, Sec 4.4 A6 A6

Knowledge, Understanding and Proficiency	IMO Reference	Textbooks, Bibliography	Teaching Aid
.4 Describe the impact of solid waste in the marine environment – Define the term solid waste – Describe how long it takes for plastic to degrade in the marine environment – Recognize the worldwide distribution of marine environment – Recognize the existence of pools of garbage in the Pacific (plastic soup) – Describe ecological impacts of marine litter – Give examples of ingestion of marine litter – Give examples of entanglement – Describe the problem of micro plastics – List economic sectors that are affected by marine litter – Describe the contribution of shipping to the marine litter problem		T8 B1 B9 B11	
5.2 Pollution prevention measures .1 List procedures designated to prevent discharges to the sea, including but not limited to waste collection procedures in ports and waste treatment on board .2 List technical installations or innovations designated to prevent discharges to the sea, including but not limited to oil waste separators	R2 R4		
6 Reputation of shipping – workshop (1 hour) .1 Recognize the value IMO places on a good reputation .2 State his/her personal opinion about the image (reputation) of shipping – Describe his/her views on the image of shipping; how other people see the shipping sector – List factors that influence the image of shipping – Recognize how a good reputation can be a valuable asset for the shipping sector – List actions he/she can take to improve the reputation of shipping .3 Relate his/her opinion to the opinions of other trainees	R6	T9	A1-Sec 5

Knowledge, Understanding and Proficiency	IMO Reference	Textbooks, Bibliography	Teaching Aid
7 Emissions to air, greenhouse gases – lecture (0.75 hour) 7.1 Environmental impact of emissions of greenhouse gases .1 Describe the impact of greenhouse gases on the global climate – Define climate change – Describe the greenhouse effect – Explain the connection between CO₂ emissions and climate change – Recognize the contribution of mankind to climate change – Recognize the difficulty of predicting the future consequences of climate change – List (potential) consequences of climate change .2 State the contribution of shipping to worldwide CO₂ emissions 7.2 Pollution prevention measures – List procedures and/or technical installation designed to minimize the emissions of greenhouse gases from shipping	R10	T10 B5	A1-Sec 4.5
8 Other emissions to the air – lecture (0.75 hour) 8.1 Environmental impact of engine emissions (SO_x, NO_x, PM) .1 List main chemical compounds in air emissions from ship engines (SO_x, NO_x, PM) .2 Recognize how these compounds are formed in ships engines .3 Describe the environmental impacts of engine emissions – Describe the process of acidification – List effects of acidification – Explain the connection between SO_x and NO_x emissions and acidification .4 Describe the main human health hazards connected to air quality – Explain the direct connection between PM and human health – Explain the contribution of SO_x, NO_x and PM emissions to smog – Recognize the adverse impact of smog to human health		T11 B8 B12	A1-Sec 4.6

Knowledge, Understanding and Proficiency	IMO Reference	Textbooks, Bibliography	Teaching Aid
.5 Describe the contribution of shipping to the problems with air emission – Identify engine emissions as an important source of air emissions from ships – Describe the link between fuel quality and ship emissions			
8.2 Other air pollutants from ships – List other air pollutants from ships, including Ozone Depletion Substances	R2		
8.3 Pollution prevention measures – List procedures and/or technical installations designed to minimize engine emissions (SO_x, NO_x, PM)	R4		
9 Introduction of invasive species including ballast water – film/lecture (1 hour)		T12 B3 B6	A1- Sec 4.7 A5
9.1 Environmental impact of transfer of species Describe the impact of the introduction of invasive species – Define the term invasive species – Describe the transfer of species through ballast water – Describe problems associated with the interdiction of alien species – Give examples of the ecological impact of invasive species – Give examples of the economic impact of invasive species – Give examples of the impact of invasive species on human health			
9.2 Pollution prevention measures .1 Describe the procedure of mid ocean ballast water mammals .2 Explain the advantages/disadvantages of mid ocean ballast water exchange .3 List ballast water treatment methods	R7	B6	A5
10 Other impacts to the marine environment – lecture (1 hour)			A1- Sec 4.8, Sec 4.9, Sec 4.10
10.1 Environmental impact of underwater noise – Describe the impact of underwater noise on marine mammals		T13	
10.2 Environmental impact of antifouling paint – Describe the list of hazardous material on ships	R8	T14	
10.3 Environmental impact of recycling of ships – Describe the impact of recycling of ships	R9	T15	